


Having described the invention the following is claimed:

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1. A gas generating material for use in a vehicle occupant protection apparatus comprising:
- about 5% to about 20% by weight of the gas generating material, of a binder,
 - 0 to about 50%, by weight of the gas generating material, of an energetic fuel; and
 - an amount of oxidizer effective to oxygen balance the gas generating material,
- wherein more than 50% by weight of the oxidizer is basic copper nitrate and wherein said binder comprises at least about 20% by volume of the gas generating material.
2. The gas generating material of claim 1 wherein the gas generating material is an extruded composite.
3. The gas generating material of claim 1 wherein the binder is a fuel and comprises at least about 20% by weight of the fuel in the gas generating material.

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4. The gas generating material of claim 1 wherein the oxidizer further comprises a metal oxide.

5. The gas generating material of claim 4 wherein the metal oxide is cupric oxide.

6. The gas generating material of claim 4 wherein the weight ratio of basic copper nitrate to the metal oxide is about 1.5:1 to about 3:1.

7. The gas generating material of claim 4 wherein the oxidizer further comprises about 5% to about 20%, by weight of gas generating material, of the potassium perchlorate.

8. The gas generating material of claim 1 wherein the amount of oxidizer in the gas generating material is about 85% to about 95% by weight of the gas generating material.

9. The gas generating material of claim 1 wherein the binder comprises a thermosetting binder.

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10. The gas generating material of claim 9 wherein the thermosetting binder is selected from group consisting of silicone and a hydroxy terminated polybutadiene.

11. The gas generating material of claim 1 wherein the binder comprises a thermoplastic binder.

12. The gas generating material of claim 11 wherein the thermoplastic binder is selected from the group consisting of cellulose acetate butyrate and a copolymer of bis-3,3-nitratomethyl-oxetane (BNMO) and nitratomethyl-methyl-oxetane (NMMO).

13. The gas generating material of claim 12 wherein the binder further comprises a plasticizer.

14. The gas generating material of claim 1 wherein the energetic fuel is selected from group consisting of guanidine nitrate and hexamine cobalt(III)nitrate.

15. An extruded solid composite gas generating material for use in a vehicle occupant protection apparatus comprising:

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about 5% to about 20% by weight of the gas generating material, of a binder, and

0 to about 50%, by weight of the gas generating material, of an energetic fuel; and

an amount of oxidizer effective to oxygen balance the gas generating material;

wherein more than 50% by weight of the oxidizer is basic copper nitrate.

16. The gas generating material of claim 15, wherein said binder comprises at least about 20% by volume of the gas generating material.

17. The gas generating material of claim 15 wherein the binder is a fuel and comprises at least about 5% by weight of the fuel in the gas generating material.

18. The gas generating material of claim 15 wherein the oxidizer further comprises a metal oxide.

19. The gas generating material of claim 18 wherein the metal oxide is copper oxide.

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20. The gas generating material of claim 18 wherein the weight ratio of basic copper nitrate to the transition metal oxide is about 1.5:1 to about 3:1.

21. The gas generating material of claim 18 wherein the oxidizer further comprises about 5% to about 20%, by weight of the oxidizer, an alkali metal or alkaline earth metal perchlorate.

22. The gas generating material of claim 15 wherein the amount of oxidizer in the gas generating material is about 85% to about 95% by weight of the gas generating material.

23. The gas generating material of claim 15 wherein the binder comprises a thermosetting binder.

24. The gas generating material of claim 23 wherein the thermosetting binder is selected from group consisting of silicone and a hydroxy terminated polybutadiene.

25. The gas generating material of claim 15 wherein the binder comprises a thermoplastic binder.

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26. The gas generating material of claim 25 wherein the thermoplastic binder is selected from the group consisting of cellulose acetate butyrate and a copolymer of bis-3,3-nitratomethyl-oxetane (BNMO) and nitratomethyl-methyl-oxetane (NMMO).

27. The gas generating material of claim 26 wherein the binder further comprises a plasticizer.

28. The gas generating material of claim 15 wherein the energetic fuel is selected from group consisting of guanidine nitrate and hexamine cobalt (III) nitrate.

29. An extruded solid composite gas generating material for use in a vehicle occupant protection apparatus, comprising:

about 5% to about 20%, by weight of the gas generating material, of a binder,

0 to about 50%, by weight of the gas generating material, of an energetic fuel,

0 to about 30%, by weight of the gas generating material, of a sinter forming material; and

an amount of oxidizer effective to oxygen balance the gas generating material;

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wherein more than 50% by weight of the oxidizer is basic copper nitrate.

30. The gas generating material of claim 29 wherein the binder is a fuel and comprises at least about 20% by weight of the fuel in the gas generating material.

31. The gas generating material of claim 29 wherein the sinter forming material is selected from the group consisting of silica and alumina.

32. The gas generating material of claim 29 wherein the oxidizer further comprises about 5% to about 20%, by weight of the oxidizer, an alkali metal nitrate, an alkaline earth metal nitrate, ammonium nitrate, an alkali metal perchlorate, an alkaline earth metal perchlorate, ammonium perchlorate, an alkali metal chlorate, an alkaline earth metal chlorate, or a mixture thereof.

33. The gas generating material of claim 29 wherein the binder is a hydroxyterminated polybutadiene.

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34. An extruded solid composite gas generating material for use in a vehicle occupant protection apparatus comprising:

about 5% to about 20% by weight of the gas generating material, of a mixture of cellulose acetate butyrate and butyl nitratroethylnitramine

0 to about 50%, by weight of the gas generating material, of an energetic fuel with a low heat of heat of combustion; and

an amount of oxidizer effective to oxygen balance the gas generating material;

wherein more than 50% by weight of the oxidizer is basic copper nitrate.

35. The gas generating material of claim 34 wherein the energetic fuel comprises guanidine nitrate, hexamine cobalt (III) nitrate, or mixtures thereof.

36. The gas generating material of claim 35 wherein the energetic fuel comprises about 20% to about 40% by weight of the gas generating material.

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37. The gas generating material of claim 36 wherein the oxidizer further comprises a mixture of sodium nitrate and ammonium perchlorate.

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